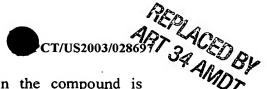


## **CLAIMS OF THE INVENTION**

That which is claimed is:

- 5 1. A pharmaceutical composition for reducing effects of Human Immunodeficiency Virus (HIV) infection, the composition comprising a therapeutically effective amount of at least one G1 phase arresting compound.
- 2. The pharmaceutical composition of claim 1, further comprising at least one antiviral agent.
  - 3. The pharmaceutical composition of claim 1, wherein the G1 phase arresting compound is a member selected from the group consisting of sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
  - 4. The pharmaceutical composition of claim 2, wherein the antiviral agent is an HIV antiviral agent.
- 5. The pharmaceutical composition of claim 4, wherein the HIV antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.
- The pharmaceutical composition of claim 2, wherein the antiviral agent is at
  least one member selected from the group consisting of: Zidovudine (ZDV, AZT),
  Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV),
  Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir
  (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.

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7. The pharmaceutical composition of claim 4, wherein the compound is administered orally, rectally, nasally, topically, vaginally or parenterally.

- 8. The pharmaceutical composition of claim 4, wherein the antiviral agent comprises tenofovir in combination with HU.
  - 9. The pharmaceutical composition of claim 4, wherein the antiviral agent comprises tenofovir, 3TC and Efavirenz in combination with HU.
- 10 10. The pharmaceutical compositions of claim 2, wherein the composition is administered alone and in combination with the antiviral agent in a cyclic therapy program.
- 11. A method for inducing increased levels of anti-HIV β-chemokines in activated
  15 lymphocytes, the method comprising:

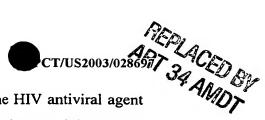
administering a composition comprising at least one G1 phase arresting agent in an effective amount to increase levels of anti-HIV  $\beta$ -chemokines, wherein the increased levels of anti-HIV  $\beta$ -chemokines bind to  $\beta$ -chemokine receptors thereby reducing viral entry of HIV.

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12. The method according to claim 11, wherein the G1 phase arresting agent is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).

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- 13. The pharmaceutical composition of claim 11, further comprising at least one antiviral agent.
- 14. The pharmaceutical composition of claim 13, wherein the antiviral agent is an 30 HIV antiviral agent.



- 15. The pharmaceutical composition of claim 14, wherein the HIV antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.
- The pharmaceutical composition of claim 13, wherein the at least one antiviral agent is a member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.
- 15 17. The pharmaceutical composition of claim 13, wherein the compound is administered orally, rectally, nasally, topically, vaginally or parenterally.
  - 18. A method for modifying synthesis of a receptor ligand to alter extracellular recognition of a receptor by an infectious agent, the method comprising:
- administering to a cell at least one G1 phase arresting agent in an amount sufficient to increase levels of the receptor ligand, thereby inhibiting entry of the infectious agent via the receptor.
- 19. The method according to claim 18, wherein the receptor ligand comprises a β-25 chemokine.
  - 20. The method according to claim 19, wherein the chemokine comprises MIP- $1\alpha$ , MIP- $1\beta$  and RANTES.
- The method according to claim 18, wherein the infectious agent is HIV.
  - 22. The method according to claim 18, further comprising administering at least one antiviral agent.



- 23. The method according to claim 22, wherein G1 phase arresting compound is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
- 24. The method according to claim 22, wherein the antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.

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25. The method according to claim 22, wherein the antiviral agent is at least one member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.

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- 26. The method according to claim 22, wherein the compound is administered orally, rectally, nasally, topically, vaginally or parenterally.
- 27. A therapeutically effective method of combating a virus infection, the method comprising:

administering to a subject a therapeutically effective amount of a composition comprising a G1 phase arresting compound to induce increased levels and availability of  $\beta$ -chemokines thereby antagonizing the function of a chemokine receptor and reducing replication of the virus infection.

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28. The method according to claim 27, wherein the  $\beta$ -chemokines comprise MIP-1 $\alpha$ , MIP-1 $\beta$  or RANTES.

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- 29. The method according to claim 27, wherein the chemokine receptor is CCR5.
- 30. The method according to claim 27, wherein G1 phase arresting compound is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
- 31. The method according to claim 27, further comprising administering an effective amount of at least one HIV antiviral agent.
- 32. The method according to claim 31, wherein the antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.
- The method according to claim 31, wherein the antiviral agent is at least one member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.
- 25 34. The method according to claim 27, further comprising administering an effective amount of an HIV vaccine.
  - 35. The method according to claim 34, wherein the HIV vaccine and the G1 phase arresting agent are administered concurrently.
  - 36. The method according to claim 32, wherein the antiviral agent and the G1 phase arresting agent are administered concurrently.

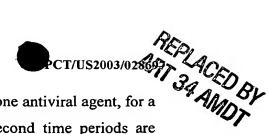
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CT/US2003/0286977 ACED By infection, the method

37. A method of maintaining viral control of an HIV infection, the method comprising:

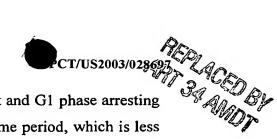
administering at least one antiviral agent in combination with at least one G1 phase arresting compound in effective amounts to inhibit replication of the HIV.

- 38. The method according to claim 37, wherein the at least one antiviral agent and the at least one G1 phase arresting compound are administered concurrently.
- 39. The method according to claim 38, wherein the G1 phase arresting compound is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
- The method according to claim 39, wherein the antiviral agent is at least one member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.
- 41. The method according to claim 41, wherein the G1 phase arresting agent is 45.
  - 42. The method according to claim 41, wherein the G1 phase arresting agent is rapamycin.
- 30 43. A therapeutically effective method to inhibit replication of HIV in a HIV infected subject, the method comprising:
  - a) administering at least one G1 phase arresting agent for a first predetermined time period; and



- b) administering the G1 phase agent with at least one antiviral agent, for a second predetermined time period, wherein the first and second time periods are sequential in a cyclic schedule.
- 5 44. The therapeutically effective method according to claim 43, wherein the G1 phase arresting agent is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
- 10 45. The therapeutically effective method according to claim 43, wherein the antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.
- 46. The therapeutically effective method according to claim 43, wherein the antiviral agent is at least one member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.
- 25 47. The therapeutic method according to claim 43, wherein the cyclic schedule comprises:
  - a) administering a combination of at least one antiviral agent and at least one G1 phase arresting agent to the HIV infected subject for a predetermined first time period;
- b) administering the at least one G1 phase arresting compound to the HIV infected subject for a second predetermined time period;

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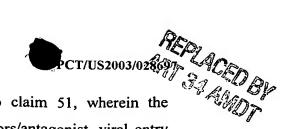
- c) administering the combination of the antiviral agent and G1 phase arresting agent to the HIV infected subject for a predetermined third time period, which is less than the first period;
- d) administering the G1 phase arresting compound to the HIV infected subject for a fourth predetermined time period which is less than the second time period; and
- e) maintaining the cyclic schedule of steps c and d until replication of the HIV increases to a predetermined level.
- 48. A method of preventing HIV infection in a subject potentially exposed to HIV, the method comprising:

administering to the subject at least one G1 phase arresting compound in an effective amount to increase levels of HIV  $\beta$ -chemokines thereby inhibiting binding of HIV to  $\beta$ -chemokine receptors.

- 15 49. The method according to claim 48, wherein the G1 phase arresting agent is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).
- 20 50. The method according to claim 48, wherein the G1 phase arresting agent is administered orally, rectally, nasally, topically, vaginally or parenterally.
  - 51. A therapeutically effective method to reduce an effective dosage of an HIV antiviral agent, the method comprising substituting the antiviral agent with a G1 phase arresting compound; augmenting the antiviral agent with a G1 phase arresting compound; or substituting a portion of the antiviral agent with a G1 phase arresting compound.
- 52. The therapeutically effective method according to claim 51, wherein the G1 phase arresting agent is a member selected from the group consisting of: sodium butyrate, aphidicolin, hydroxyurea (HU), olomoucine, roscovitine, tocopherols, tocotrienols, and rapamycin (RAPA).

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- 53. The therapeutically effective method according to claim 51, wherein the antiviral agent is a nucleoside RT inhibitor, CCR5 inhibitors/antagonist, viral entry inhibitor or functional equivalent thereof.
- 5 54. The therapeutically effective method according to claim 51, wherein the antiviral agent is at least one member selected from the group consisting of: Zidovudine (ZDV, AZT), Lamivudine (3TC), Stavudine (d4T), Didanosine (ddl), Zalcitabine (ddC), Abacavir (ABC), Emirivine (FTC), Tenofovir (TDF), Delaviradine (DLV), Efavirenz (EFV), Nevirapine (NVP), Fuzeon (T-20), Saquinavir (SQV), Ritonavir (RTV), Indinavir (IDV), Nelfinavir (NFV), Amprenavir (APV), Lopinavir (LPV), Atazanavir, Combivir (ZDV/3TC), Kaletra (RTV/LPV), Trizivir (ZDV/3TC/ABC), SCH-C, SCH-D, PRO 140, TAK 779, TAK-220, RANTES analogs, AK602, UK-427, 857, monoclonal antibodies, NB-2, NB-64, T-649, T-1249, and functional analog thereof.

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